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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/848,577	05/03/2001	Young-Hoon Park	YPL-0017	6816

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Cantor Colburn LLP
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Bloomfield, CT 06002

EXAMINER

MOORE, KARLA A

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 03/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

AS

Office Action Summary	Application No.	Applicant(s)	
	09/848,577	PARK, YOUNG-HOON	
	Examiner	Art Unit	
	Karla Moore	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 7-20 is/are rejected.
- 7) ☒ Claim(s) 6 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05/03/01 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 3-5, 14, 17-18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,338,363 to Kawata et al. in view of U.S. Patent No. 6,217,658 to Orczyk et al.
3. Kawata et al. disclose a thin film deposition reactor in Figure 10 substantially as claimed and comprising: a reactor block (201) on which a wafer is placed; a showerhead plate (17) for uniformly maintaining a predetermined pressure by covering the reactor block; a wafer block (5) installed in the reactor block, on which the wafer is to be seated; an exhausting portion (20) connected to the reactor block for exhausting a gas from the reactor block; a first connection line (19a, 19b) in communication with the shower head plate capable of supplying a first reaction gas; a second connection line (28) in communication with the showerhead plate capable of supplying a second inert gas; and a diffusion plate (11) mounted on a lower surface of the showerhead plate, the diffusion plate having a plurality of spray holes (12) which are in communication with the first connection line and face the upper face of the wafer and capable of spraying the first reaction gas and/or inert gas onto the wafer, and a plurality of nozzles (Figure 5, 25-upper surface and narrow portion leading to reaction space 4) which is in communication a passage (horizontal passage connected to second connection line/28) radially formed from the second connection line and extend toward the inner surface side of the reactor block to spray the second reaction gas and/or inert gas toward the edges of the wafer.
4. However, Kawata et al. fail to teach each of the first and second connection lines capable of supplying a reaction gas and a inert gas.

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5. Orczyk et al. teaches the use of a gas delivery system for providing gases from several sources (both inert and reactive) to a chamber for processing. In some embodiments it is desirable not to mix gases prior to injection into the chamber therefore various connections and nozzles are disclosed (Figures 1a and 1b; column 6, row 48 through column 7, row 20).

6. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided several sources (both inert and reactive) with the appropriate connections for delivering the gases to the chamber in Kawata et al. in order to deliver gases that are not mixed prior to injection as taught by Orczyk et al.

7. With respect to claims 3, 18 and 20, although not illustrated, Kawata et al. teach the diffusion plate having a lower surface of convex form (column 6, rows 32-38).

8. With respect to claim 4, the diffusion plate further comprises a first diffusion plate (11a) in communication with the plurality of spray holes and the first connection line and a second diffusion plate (11b) in communication with the plurality of nozzles and the second connection line (see Figure 5).

9. With respect to claim 5, Kawata et al. teach a first mixing portion (inside of 17) at a center of the inside of the diffusion plate capable of mixing two gases.

10. However, Kawata et al. fail to teach the mixing portion capable of mixing a first reaction gas and an inert gas.

11. Orczyk et al. further teach the use of mixing plenum (Figure 1a, 48) for the purpose of mixing gases (both reactive and inert) supplied to a particular nozzle prior to flowing into a chamber (column 7, rows 51-56).

12. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a mixing plenum capable of mixing inert and reactive gases in Kawata et al. in order to mix the gas prior to being supplied to a nozzle and flowing into the processing chamber.

13. With respect to claim 7, the area of the diffusion plate on which the spray holes are formed is larger than the wafer (Figure 10).

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14. With respect to claims 14 and 17, the reactor further comprises a pumping baffle (13) which is installed on the outer circumference of the wafer block, the pumping baffle comprising a sidewall (above baffle and towards the center of the reactor) placed around the lateral side of the wafer block, a bottom wall (below baffle and towards exterior of baffle) extended outward from a lower end of the sidewall, and holes (for heater 8 and leading to exhaust 20) formed in the bottom wall. Both the heater holes and exhaust holes are formed on each side of the reactor and are therefor symmetrical.

15. Claims 2 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawata et al. and Orczyk et al. as applied to claims 1, 3-5, 7, 14, 17-18 and 20 above, and further in view of U.S. Patent No. 5,439,524 to Cain et al.

16. Kawata et al. and Orczyk et al. disclose the invention substantially as claimed and as described above.

17. However, Kawata et al. and Orczyk et al. fail to teach a diffusion plate with at lower surface of a concave form.

18. Cain et al. teach a diffusion plate with a concave form (Figure 2) for the purpose of significantly improved uniformity of processing (column 3, rows 48-57 and column 4, rows 40-46).

19. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a diffusion plate with a concave form in Kawata et al. and Orczyk et al. in order to provide improved uniformity of processing as taught by Cain et al.

20. Claims 8-9 and 12 rejected under 35 U.S.C. 103(a) as being unpatentable over Kawata et al. and Orczyk et al. as applied to claims 1, 3-5, 7, 14, 17-18 and 20 above, and further in view of U.S. Patent No. 5,976,261 to Moleshi et al.

21. Kawata et al. and Orczyk et al. disclose the invention substantially as claimed and as described above.

22. However, Kawata et al. fail to teach specifically teach the diameter of the spray holes being 1 to 2.5 mm or the number of spray holes being 100-1000.

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23. Moleshi et al. teach that in showerhead design the diameter and the number of spray holes can be varied to optimize flow control and uniformity (column 5, rows 34-36).

24. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have varied the diameter and number of spray holes in Kawata et al. and Orczyk et al. in order to optimize flow control and uniformity as taught by Moleshi et al.

25. Claims 10 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawata et al. and Orczyk et al. as applied to claims 1, 3-5, 7, 14, 17-18 and 20 above, and further in view of U.S. Patent No. 5,425,812 to Tsutahara et al.

26. Kawata et al. and Orczyk et al. disclose the invention substantially as claimed and as described above.

27. However, Kawata et al. and Orczyk et al. fail to teach a spray hole comprising a lower and upper end and the upper end has a diameter larger than that of the lower end and a step portion is formed between the upper and lower end.

28. Tsutahara et al. teach a spray hole configuration (Figure 15; column 9, rows 21-26) comprising a larger diameter upper portion and a smaller diameter lower portion formed in between for the purpose of maintaining a blowout flow from each hole at a constant rate and to supply thoroughly diffused gas to the surface of the water and to prevent drifting of the flow.

29. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a spray hole configuration in Kawata et al. and Orczyk et al. comprising a larger diameter upper portion and a smaller diameter lower portion with a step portion formed in between in order to maintain blowout flow from each hole at a constant rate and to supply thoroughly diffused gas to the surface of the wafer and prevent drifting of the flow as taught by Tsutahara et al.

30. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawata et al., Orczyk et al. and Tsutahara et al. as applied to claims 10 and 15 above, and further in view of Japanese Patent No. 09-316644 to Arai et al.

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31. Kawata et al., Orczyk et al. and Tsutahara et al. disclose the invention substantially as claimed.

32. However, Kawata et al., Orczyk et al. and Tsutahara et al. fail to teach a diffusion plate with a thickness of at least 5 mm.

33. Arai et al. teach the use of a diffusion plate with a thickness of at least 5 mm for the purpose of obtaining a thin film of good quality in a short time (solution of abstract).

34. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a diffusion plate with a thickness of at least 5 mm in Kawata et al., Orczyk et al. and Tsutahara et al. in order to obtain a thin film of good quality in a short time as taught by Arai et al.

35. Claim 13 rejected under 35 U.S.C. 103(a) as being unpatentable over Kawata et al. and Orczyk et al. as applied to claims 1, 3-5, 7, 14, 17-18 and 20 above, and further in view of U.S. Patent No. 5,076,207 to Washitani et al.

36. Kawata et al. and Orczyk et al. disclose the invention substantially as claimed.

37. However, Kawata et al. and Orczyk et al. fail to teach a distance between the diffusion plate and wafer block of 20-50 mm.

38. Washitani et al. teach a distance between the diffusion plate and wafer block of 20-50 mm for the purpose of obtaining a satisfactory film forming speed and a high degree of surface uniformity (Washitani et al. specifically teach a distance of 8-25 mm; column 5, rows 13-15).

39. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have allowed a distance of 20-50 mm between the diffusion plate and wafer block in Kawata et al. and Orczyk et al. in order obtain a satisfactory film forming speed and a high degree of surface uniformity as taught by Washitani et al.

40. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawata et al. and Orczyk et al. as applied to claims 1, 3-5, 7, 14, 17-18 and 20 above and further in view of Japanese Patent No. 09-316644 to Arai et al.

41. Kawata et al. and Orczyk et al. disclose the invention substantially as claimed.

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42. However, Kawata et al. and Orczyk et al. fail to teach a diffusion plate with a thickness of at least 5 mm.

43. Arai et al. teach the use of a diffusion plate with a thickness of at least 5 mm for the purpose of obtaining a thin film of good quality in a short time (solution of abstract).

44. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a diffusion plate with a thickness of at least 5 mm in Kawata et al. and Orczyk et al. in order to obtain a thin film of good quality in a short time as taught by Arai et al.

Response to Arguments

45. Applicant's arguments, filed 01/06/04, with respect to the rejection(s) of claim(s) 1, 3-5, 7, 14, 17-18 and 20 under 102 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Orczyk et al. New art (Orczyk et al.) has been relied upon for teachings of both an inert gas and an reactive gas being supplied through each of the first and second connection lines.

46. Applicant's arguments, filed 01/06/04, with respect to claim 6 have been fully considered and are persuasive. The 103 rejection of claim 6 has been withdrawn.

Allowable Subject Matter

47. Claim 6 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

48. The following is a statement of reasons for the indication of allowable subject matter: The prior art of record fails to teach:

A thin film deposition reactor comprising: a reactor block on which a wafer is placed; a shower head plate for uniformly maintaining a predetermined pressure by covering the reactor block; a wafer block installed in the reactor block, on which the wafer is to be seated; an exhausting portion connected to the reactor block for exhausting a gas from the reactor block; a first connection line in communication with the shower head plate for supplying the first reaction gas and an inert gas; a second connection in

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communication with the shower head plate for supplying a second reaction gas and the inert gas; and a diffusion plate mounted on a lower surface of the shower head plate, the diffusion plate having a plurality of spray holes which is in communication with the first connection line and face the upper surface of the wafer to spray the first reaction gas and the inert gas onto the wafer, and a plurality of nozzles which is in communication with a passage radially formed from the second connection line and extend toward an inner side surface of the reactor block to spray the second reaction gas and the inert gas toward edges of the wafer, whereby the first and second reaction gases are applied to the wafer without mixing each other. **The reactor further comprising a second mixing portion between the second connection line and the shower head plate for mixing the second reaction gas and the inert gas supplied from the second connection line and diffusing the mixture to the nozzles through the passage, the second mixing portion having an auxiliary diffusion plate in which holes are formed.**


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karla Moore whose telephone number is 571.272.1440. The examiner can normally be reached on Monday-Friday, 8:30am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on 571.272.1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

km
12 March 2004


Parviz Hassanzadeh
Primary Examiner
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